

IV. "On the comparative Action of Hydroxylamine and Nitrites upon Blood-pressure." By T. LAUDER BRUNTON, M.D., F.R.S., and T. JESSOPP BOKENHAM. Received February 7, 1889.

This communication forms part of an investigation on which one of us (Brunton) has been engaged for some years past, and in aid of which grants have been received from this Society.*

In this investigation the action of various compound ammonias,† and also of some nitrites,‡ and allied bodies,§ has been examined.

The plan of research required hydroxylamine (NH_2OH), forming as it does a link between these two classes of bodies, to be specially examined. The action of this body has recently become a subject of experiment by other workers,|| and it therefore seems advisable to publish now one remarkable relationship between it and nitrites, reserving for a later communication other results of this research. Two of the most striking effects of nitrites are: their power (*a*) to alter the colour of the blood,¶ and (*b*) to lower the pressure of blood within the vessels.**

Both of these properties are also possessed by nitroglycerine,†† and Hay has shown that the effect of this substance is due to the fact that it is decomposed in the blood with evolution of nitrous acid.‡‡

Hydroxylamine is a body in which two affinities of nitrogen are saturated by hydrogen instead of by oxygen as in nitrous acid. Its relation to nitrous acid will be seen by a comparison of their graphic formulæ—



* May, 1874, for investigation of the physiological action of ammonia, and others in 1877, 1884, and 1887.

† Brunton and Cash, 'Phil. Trans.,' 1884, p. 197.

‡ Brunton and Gresswell. Details not published. *Vide* 'St. Bartholomew's Hospital Reports,' 1876, p. 143, and 'Pharmaceutical Journal,' December 22, 1888, pp. 491 and 495.

§ Brunton and Tait, "Physiological Action of Nitroglycerine," 'St. Bartholomew's Hospital Reports,' 1876, p. 140.

|| Binz, "Toxicologisches über das Hydroxylamin," 'Virchow's Archiv.'

¶ A. Gamgee, 'Phil. Trans.,' 1868, pp. 589—626.

** Gamgee, quoted by Brunton, 'Lancet,' 1867, July 27. Brunton, 'Ludwig's Arbeiten,' 1869.

†† Brunton and Tait, 'St. Bartholomew's Hospital Reports,' 1876, p. 141.

‡‡ Hay, "The Chemical Nature and Physiological Action of Nitroglycerine," 'Practitioner,' June, 1883, vol. 30, p. 429.

It was shown by Raimondo and Bertoni* to have the power of producing a chocolate-brown colour of the blood, of lessening its oxidising power, and of producing a change in its spectrum, changes similar to those observed by Gamgee as consequences of the action of nitrites.† Loew‡ found it to be a powerful protoplasmic poison. From a consideration of its chemical properties, Binz§ was led to think that it must be reckoned amongst the bodies which cause paralysis of cells in the nerve-centres, either by setting free active oxygen or one of the halogens, and his experiments showed the correctness of his hypothesis. Raimondo and Bertoni thought that during the reaction between hydroxylamine and blood nitrous acid was formed, and Binz obtained the reaction of nitrites from the blood of animals poisoned by it.

It therefore seemed probable that it would affect the blood-pressure in a similar way to nitrites, and on testing it we found that it does. On injecting the hydrochlorate of hydroxylamine either into the veins or peritoneal cavity, it produces a fall of blood-pressure almost exactly similar to that produced by nitrite of amyl, as will be seen by a comparison of the accompanying curves, in which the fall of blood-pressure is so much alike that it is almost impossible to tell from a mere inspection of the tracings which is due to hydroxylamine and which to amyl nitrite. As hydroxylamine itself is very unstable, and is readily converted into ammonia, we used the hydrochlorate, which we obtained from Messrs. Hopkin and Williams. As hydroxylamine is made commercially by the reduction of nitrites, it appeared possible that the specimen we employed might be contaminated by nitrites, and that its action upon the blood-pressure might be due to impurity and not to the action of the hydroxylamine itself. On testing the specimen we employed by starch-paste and iodine with acetic, sulphuric or hydrochloric acid we got no reaction, and Messrs. Hopkin and Williams also told us that it gave no reaction with metaphenylenediamine.

We may therefore regard the specimen as pure, and attribute the fall of blood-pressure to the action of the hydroxylamine hydrochlorate, and not to any impurities contained in it.

* Raimondi and Bertoni, 'Annali Univ. di Med.,' vol. 259, 1882, p. 97. Only known to us by abstract in Virchow and Hirsch's 'Jahresber.' for 1882, 1, pp. 393 and 394.

† Gamgee, 'Phil. Trans.,' 1868.

‡ Loew, 'Archiv f. d. ges. Physiol.,' 1885, vol. 35, p. 516.

§ Binz, *op. cit.*